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RESPONSE TO "REPORT OF J. L. ALVAREZ AND J. A. AUXIER REGARDING WASTE RETRIEVAL FROM PIT 9, THE 90 5 DESIGN"

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INTRODUCTION

This white paper is a point by point discussion of the "Report Of Joseph L. Alvarez, Ph.D., CHP And John A. Auxier, Ph.D., CHP Regarding Waste Retrieval From Pit 9, 90% Design.

It is important to discuss the background and professional interest in the Pit 9 waste retrieval of the author of this paper. The author has a Masters degree in Nuclear Engineering (with emphasis in Health Physics), is a Certified Health Physicist, and is qualified as the Nuclear Safety Technical Lead at the Idaho National Engineering and Environmental Laboratory (INEEL). The author was the Lead Criticality Safety Engineer during the majority of the original Pit 9 project, operated by Lockheed Martin Advanced Environmental Systems (LMAES).

Much of this IDEQ report is based on review of documents written for drilling activities conducted for the Operable Unit 7-10 Interim Action (Alternate Pit 9 Project). The analysis of the Alternate Pit 9 Project was performed knowing that this activity would be of limited scope and thus many of the conclusions made in the IDEQ report (for instance: "there is no possibility for a nuclear criticality") were based on a review of the drilling activities.

DISCUSSION

Section 5.a Analysis of Criticality Potential: The report provides an analysis of criticality potential in Section 5. For this analysis one of the references was "N. L. Pruvost and H. C. Paxton, Nuclear Criticality Safety Guide, Los Alamos National Laboratory, LA-12808, September 1996". Mr. Norm Pruvost, the author of the reference, was a subcontractor for LMAES during the original Pit 9 project. Mr. Pruvost's professional opinion, during the original Pit 9 Project, was in opposition to the criticality safety conclusions of the IDEQ report.

The report makes numerous technical errors and erroneous assumptions, as discussed below:

1. "...plutonium is chiefly in a nitrate matrix; nitrates are neutron absorbers, or poisons for a critical assembly". *This statement is erroneous. Nitrates would be considered poisons only when compared to perfect non-absorbers such as oxygen or carbon. The 1978, Idaho Chemical Processing Plant criticality accident is a real world counter to this statement since the chemicals involved were; aluminum nitrate, tributyl phosphate, kerosene, and nitric acid (HNO_3).*
2. "All graphite waste was subcritical when placed in Pit 9, any disturbance of the graphite , such as breakage or scouring, would decrease the potential for criticality even further". *While it is agreed that a criticality based on moderation/reflection in a graphite matrix is incredible, the statement is erroneous in that any action that would render the plutonium/graphite matrix more homogeneous would only serve to drive the system closer to criticality.*
3. "The 380 gram and digface monitoring recommendations from INEEL/EXT-2000-00690 are unnecessary and excessive since the report showed that a criticality was not possible under the planned methods and conditions". *What is not considered in the IDEQ report is that there has never been an assumption that criticality is possible at the digface. The point of concern is after the waste has been retrieved. There is evidence that some waste drums may have up to 1200 grams of Plutonium. The waste recovered from these drums would at some time later in the process be concentrated (probably through a mechanical means). Concentration of fissile materials starting from the higher levels result in fissile concentrations that could lead to a criticality. Recall that the waste matrices are polyethylene, organic sludge, and graphite, all of which are optimum materials to be used as moderators for a critical system.*

Section 5.b Analysis of Fire Potential: The report states that fire is extremely unlikely. However, the report authors base their conclusion on an analysis of sonic drilling of Pit 9. Certainly, when the waste is only exposed to limited amounts of air, as would be the case in a drilling operation, the IDEQ report's conclusion is valid. During excavation the scenario changes drastically. Organics, among which are nitrates will be exposed to air. Nitrates can have a propensity to become unstable chemically.

If a fire were to occur the release mechanism would be much more energetic than was presented in the IDEQ report. While an offsite release would still probably not occur, significant onsite releases could be possible. The report does not take this into account nor the costs and increased public scrutiny that would result from an uncontrolled release, even were it to be contained onsite.

Section 6 Evaluation of Stage II Remediation Approach Versus Risk Based Needs For Personnel and Local Environment

1. The Report suggests that a single source (single drum box) excavation occur to control contamination. The report does not consider the cost of this inefficient method of waste retrieval.
2. The report suggests that soils be continuously monitored for >10nCi/g. The report does not suggest a method. While "soil sorters" have been proven successful for Co-60, and depleted uranium contaminated soils, soil sorters have not been proven with low energy gamma emitting nuclides such as Am-241 and Pu-239.
3. The report suggests that the waste collection bags proposed would rip and spread contamination. The bags proposed for use by the Alternate Pit 9 project have been used by the mining and chemical industries for quite some time. These bags routinely store/contain materials greater than 750 lbs without spillage.

General

1. The IDEQ report does not take into account the risk that DOE would assume if the small scale excavation, with minimal controls, were carried out. Even small releases to the environment would be seized upon by the "interveners as more evidence of DOE failure. Not to mention the fact that DOE has an obligation to ensure that DOE workers are fully protected.
2. The IDEQ report does not take into account INEEL Evaluation Guidelines (EGs) [ID O 420.D]. ID O 420.D requires that if unmitigated accidents have the potential to exceed the EGs, then the INEEL contractor must take steps to reduce the potential or the consequences of the accident. The EGs are not overly conservative and are not based on ALARA principles but ensure that workers do not receive non-stochastic (or immediately harmful) exposures to radiation or chemicals.
3. There is a wealth of information regarding Pit 9. The IDEQ report uses six references to make some broad conclusions.

CONCLUSION

The IDEQ report contains factually inaccurate information and arrives at inappropriate conclusions. It is recommended that in future reports, a more thorough review of all available data be made.